

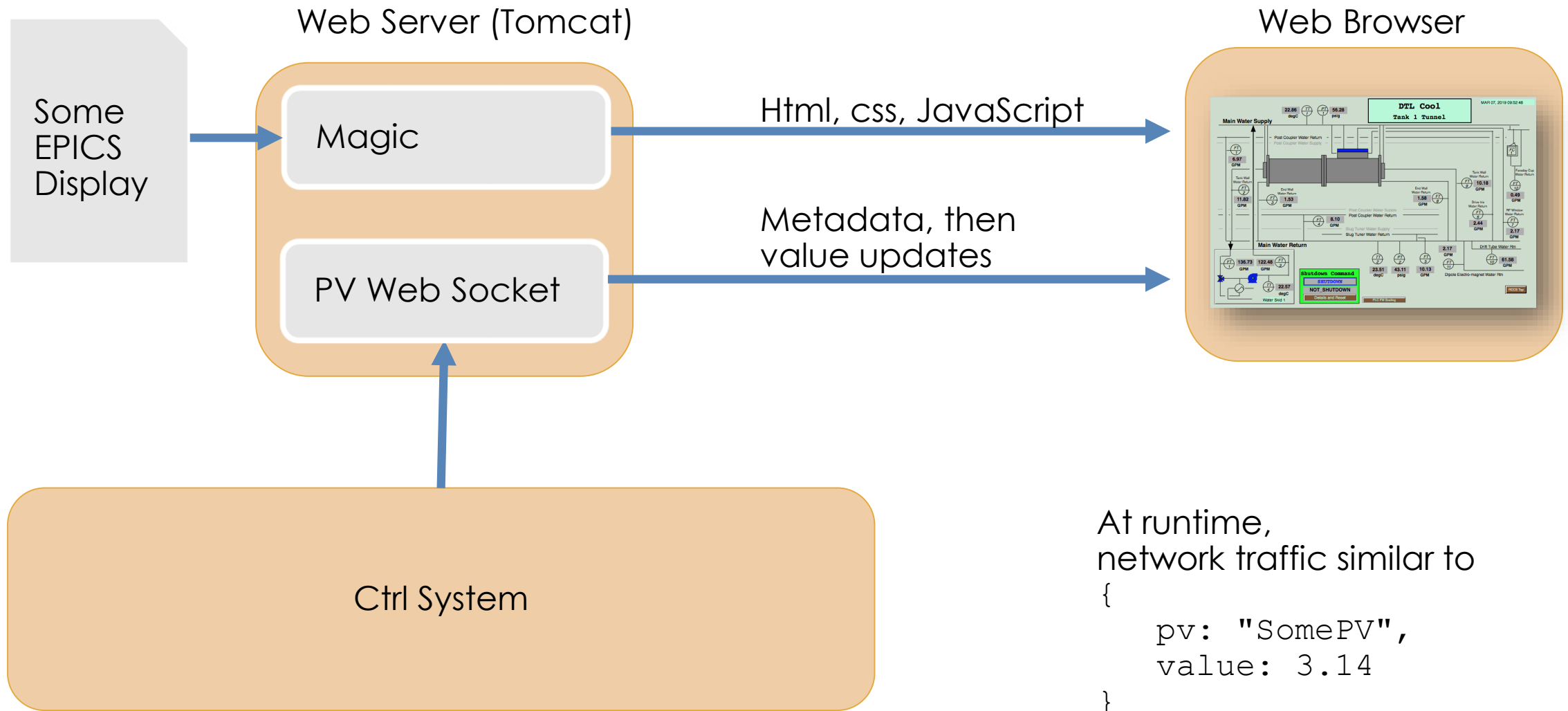
# Display Builder Web Runtime

<https://github.com/kasemir/pvws>

<https://github.com/kasemir/dbwr>

Kay Kasemir, June 2019

# General Web Display Idea

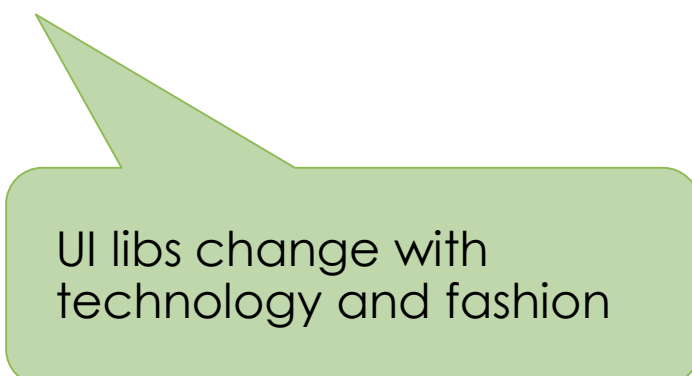


At runtime,  
network traffic similar to

```
{  
  pv: "SomePV",  
  value: 3.14  
}
```

# EPICS Operator Interfaces

198x	edd/dm	X11, <i>Xt</i>
199x	medm, dm2k	<i>Motif</i>
200x	edm	<i>Motif</i>
2010	CS-Studio BOY	<i>SWT</i>
2017	CS-Studio Display Builder	<i>JavaFX</i>
Also:	tcl/tk/ca, python/qt/ca, ..	<i>TK</i> <i>Qt</i>

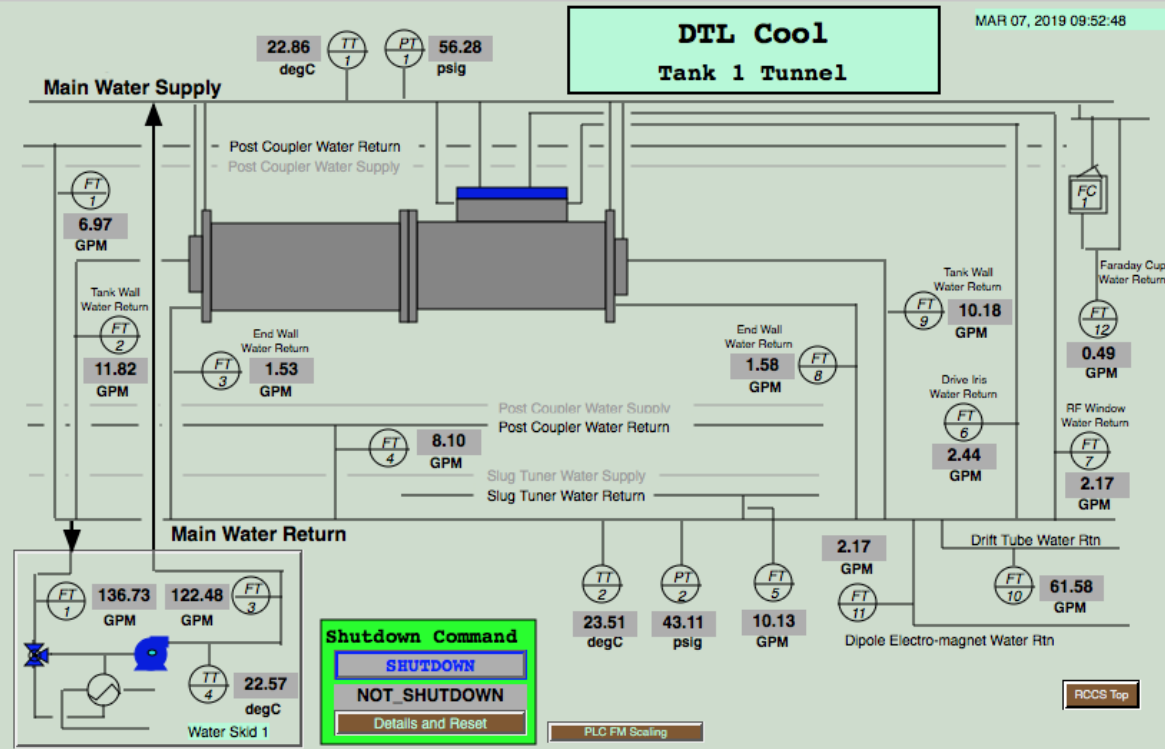
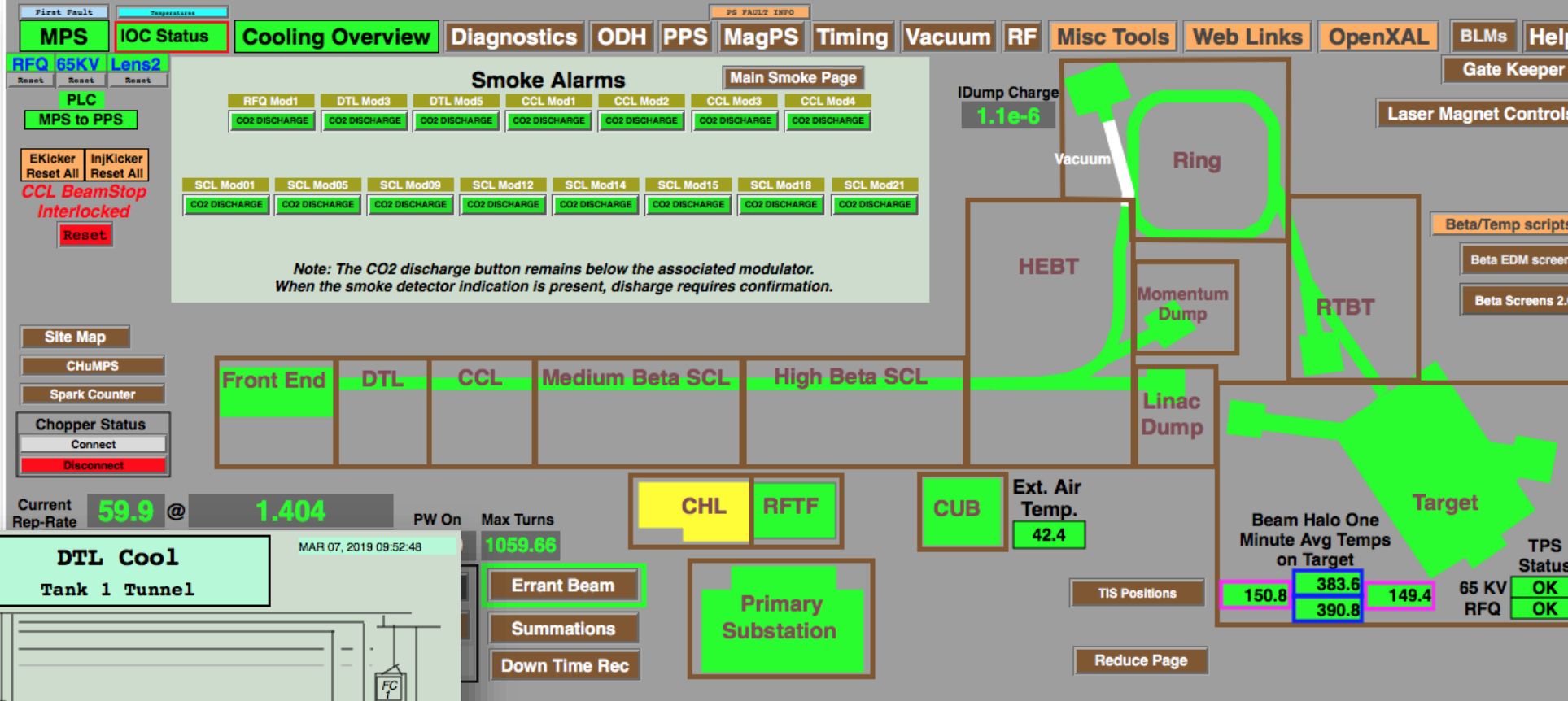


UI libs change with  
technology and fashion

# Web EDM

Ryan Slominski,  
JLab,

2017 EPICS Meeting



Very useful and performant  
for EDM displays  
and Channel Access IOCs

Limitations:

- No waveforms (plots, images)
- No metadata from non-IOC servers (LabView, Python)
- No PV Access support

# PV Web Socket - <https://github.com/kasemir/pvws>

- Based on Phoebus Stack
  - VType PV for loc://, sim://, ca://, pva://, ...
  - PV Pooling
  - RxJava Throttling
- Data Packaged as JSON
  - Sends metadata once
    - No separate connections to \*.EGU, \*.PREC, ...
  - Severity and value on change
  - Arrays packed as Base64-binary
  - JavaScript in client merges updates

## Subscribe to PVs

A 'subscribe' JSON message requests updates for one or more PVs.

```
{ "type": "subscribe", "pvs": [ "sim://sine", "loc://x(4)" ] }
```

A 'clear' JSON message cancels updates for one or more PVs.

```
{ "type": "clear", "pvs": [ "sim://sine", "loc://x(4)" ] }
```

## Messages

```
{  
  "type": "update",  
  "pv": "SCL_LLRF:IOC01a:Load",  
  "units": "%",  
  "precision": 0,  
  "severity": "NONE",  
  "value": 18.91891891891892  
}
```



# Display Builder Web Runtime - <https://github.com/kasemir/dbwr>

Instruments Data Collection & Scan Status

	Scan State	Progress	Scan Alarm	Run	Run Time	Pause	nED/ADnED
BL1A USANS	Running	64 %	No Alarm	Run	11154 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL1B NOMAD	Aborted	100 %	No Alarm	Idle	10 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL2 BASIS	Aborted	100 %	No Alarm	Run	276.7 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL3 SNAP	Finished	100 %	No Alarm	Run	6088 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL4A M-REF	Running	18 %	No Alarm	Run	4380.3 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL4B L-REF	Running	40 %	No Alarm	Run	389 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL5 CNCS	Running	7 %	No Alarm	Run	19 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL6 EQ-SANS	Aborted	100 %	No Alarm	Idle	715 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL7 VULCAN	Running	23 %	No Alarm	Run	846 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL9 CORELLI	Finished	100 %	No Alarm	Idle	126 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL10 VENUS							
BL11A POWGEN	Running	87 %	No Alarm	Run	9671 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL11B MANDI	Aborted	100 %	No Alarm	Run	2581 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL12 TOPAZ	Running	80 %	No Alarm	Run	22188.5 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL14B HYSPEC	Aborted	100 %	No Alarm	Run	484 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL16B VISION	Running	5 %	No Alarm	Run	2288 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL17 SEQUOIA	Running	65 %	No Alarm	Run	70 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>
BL18 ARCS	Finished	100 %	No Alarm	Idle	10 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>

Instruments

Accelerator Mode: Target Power: 1383.68 kW Charge: 2.323E-5 C Energy: 1011.448 Mev Rate: 59.9 Hz

HFIR

**BL-1A USANS**

● Shutter

● Run Run

● Scan Running

Main

● T0 Chopper

● IPPS

**BL-1B NOMAD**

● Shutter

● Run Idle

● Scan Aborted

Main

● T0 Chopper

● Choppers

● Vacuum

● IPPS

**BL-2 BASIS**

● Shutter

● Run Run

● Scan Aborted

Main

● Vacuum

● IPPS

**BL-3 SNAP**

● Shutter

● Run Run

● Scan Finished

Main

● T0 Chopper

● IPPS

**BL-4A MRef**

● Shutter

● Run Run

● Scan Running

Main

● Choppers

● IPPS

**BL-4B LRef**

● Shutter

● Run Run

● Scan Running

Main

● Choppers

● IPPS

**BL-5 CNCS**

● Shutter

● Run Run

● Scan Running

Main

● Choppers

● IPPS

**BL-6 EQ-SANS**

● Shutter

● Run Idle

● Scan Aborted

Main

● Vacuum

● Choppers

● IPPS

**BL-7 VULCAN**

● Shutter

● Run Run

● Scan Running

Main

● Detector

● Choppers

● IPPS

**BL-9 CORELLI**

● Shutter

● Run Idle

● Scan Finished

Main

● Vacuum

● Choppers

● T0 Chopper

● IPPS

**BL-10 VENUS**

**BL-11A POWGEN**

● Shutter

● Run Run

● Scan Running

Main

● Vacuum

● Choppers

● T0 Chopper

● IPPS

**BL-11B MANDI**

● Shutter

● Run Run

● Scan Aborted

Main

● Vacuum

● Choppers

● IPPS

**BL-12 TOPAZ**

● Shutter

● Run Run

● Scan Running

Main

● IPPS

**BL-13 FNPB**

● Shutter

Main

● Choppers

● IPPS

**BL-14B HYSPEC**

● Shutter

● Run Run

● Scan Aborted

Main

● Choppers

● IPPS

**BL-15 NSE**

● Shutter

● IPPS

**BL-16B VISION**

● Shutter

● Run Run

● Scan Running

Main

● Vacuum

● T0 Chopper

● IPPS

**BL-17 SEQUOIA**

● Shutter

● Run Run

● Scan Running

Main

● Vacuum

● Choppers

● Detector/nED

● IPPS

**BL-18 ARCS**

● Shutter

● Run Idle

● Scan Finished

Main

● Vacuum

● Choppers

● IPPS

Summaries

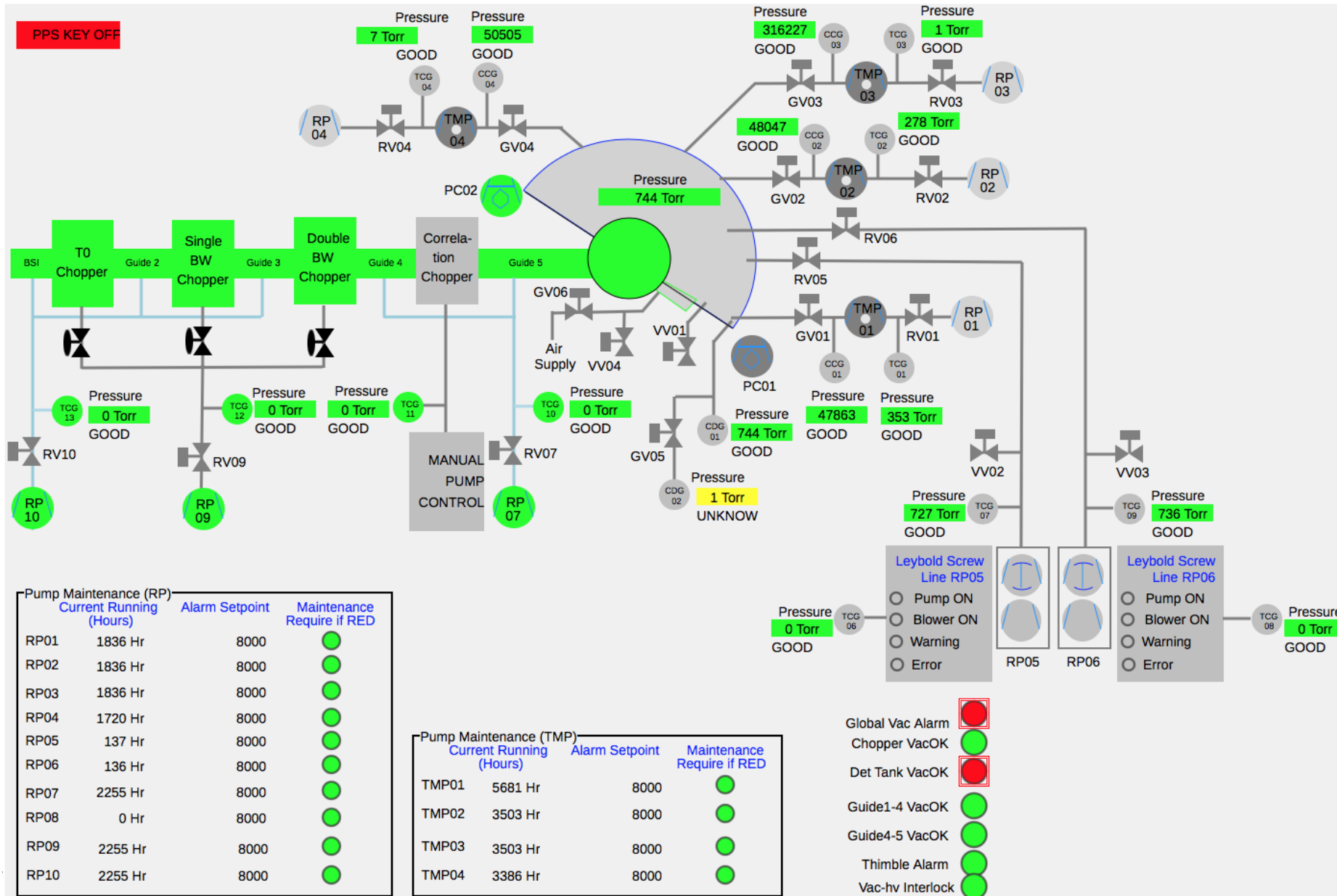
SE Cage CMF NCL Gateways ODH Instruments Data Archives Vacuum

HFIR

	Scan State	Progress	Scan Alarm	Run	Run Time	Pause	nED/ADnED	ADnED	SMS
HB2B NRSF2	Finished	100 %	No Alarm	Idle	148.3 s	Not Paused	<span style="color: green;">●</span> <span style="color: green;">●</span>	Idle	OK
HB2C WAND	Finished	100 %	No Alarm	Idle	5 s	Not Paused	<span style="color: red;">●</span> <span style="color: green;">●</span>	Idle	OK
CG1D IMAGING	CG1D:CS:Sca	CG1D:CS:Sca	CG1D:CS:Sca						

Labels, LEDs, Text Updates  
Groups, Embedded displays, Macros

# 'Static' Widgets



Lines,  
Circles,  
Rectangles, ..

Limited 'Rule'  
Support:  
Some colors,  
Hide/Show

# Line and Detector plots

VULCAN Neutron Stats
Favorites

### East Detector

ROI Left: 0 Top: 0 Width: 200 Height: 200 Default  
 DSpace ROI Start: 1.241 End: 1.205 Default  
 Detector ROI: 618110 DSpace: 168122

East Cursor (only available at beamline)  
Info

### West Detector

ROI Left: 0 Top: 0 Width: 160 Height: 30 Default  
 DSpace ROI Start: 1.766 End: 1.831 Default  
 Detector ROI: 465727 DSpace: 2716

West Cursor (only available at beamline)  
Info

### LPSD Detector

ROI Left: 0 Top: 7 Width: 78 Height: 253 Default  
 DSpace ROI Start: 3.257 End: 3.468 Default  
 Detector ROI: 951542 DSpace: 0

LPSD Cursor (only available at beamline)  
Info

500.000

500.000

500.000

Summary				
Detector ROIs:	2035465	2245 e/s	DSpaces: 170837	Beam Power: 1410847 Watts
BM1 Counts:	422883	433 e/s	Time-Of-Flight	Proton Charge: 6E+11 pC
BM2 Counts:	1649309	1817 e/s	<input type="checkbox"/>	Run time: ###.###

East Detector More Detail

West Detector More Detail

LPSD Detector More Detail

Instrument Pole More Detail

Material Pole More Detail

### Instrument Pole Plot

ROI Left: 11 Top: 24 Width: 23 Height: 30  
 Detector ROI: 0  
 500.000

ROI Left: 66 Top: 18 Width: 83 Height: 57  
 Detector ROI: 1245  
 500.000

### Material Pole Plot

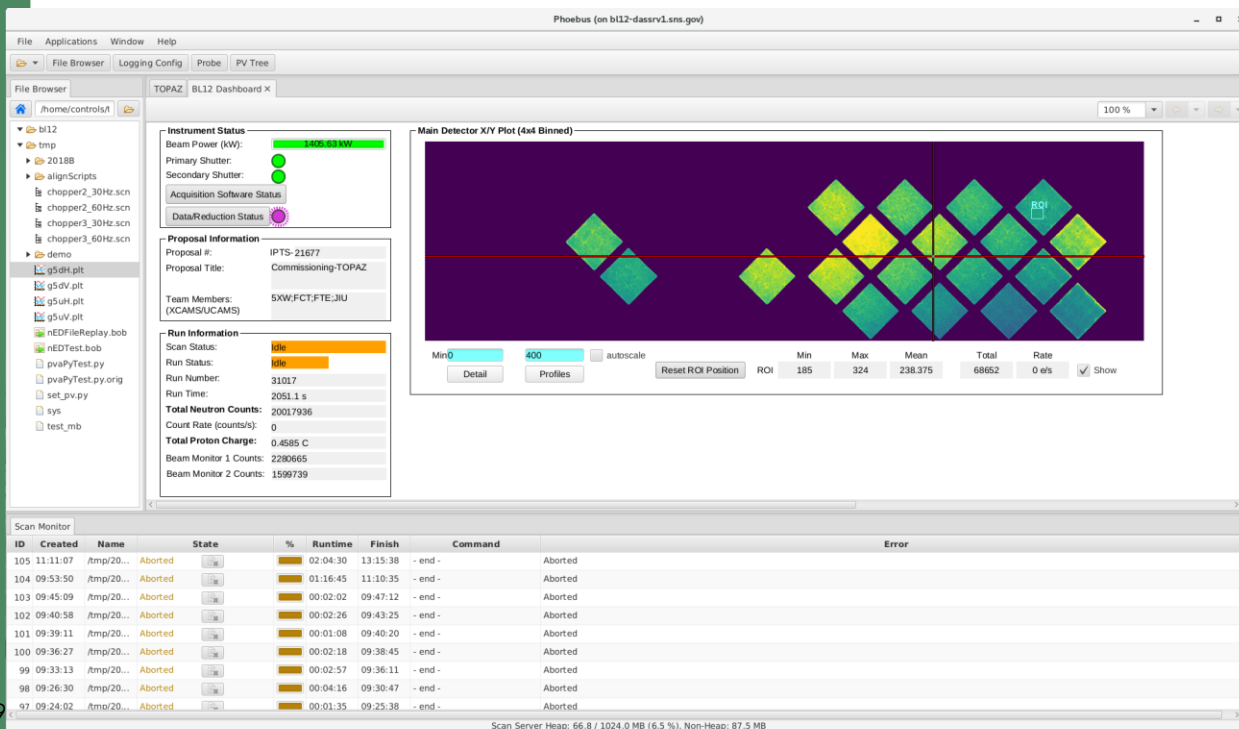


# CS-Studio on Desktop vs.

- Integrated Product
- Robust Development
  - Type checking
  - Single-Language

# Web Runtime

- Just Display Runtime
- Fragile Development
  - No type checking
  - Client: HTML, CSS, JS
  - Server: Java, Python, ...
  - Different Web Browsers



*Still:  
Read-only web view of  
control system is extremely  
convenient and useful!*

# Status: New Project, but already very useful

- Label
- Rectangle
- Ellipse
- Arc
- Polyline
- Polygon
- Text Update
- Text Input
- Text formatting (precision, units, enum labels)
- LED
- Multi-State LED
- Action Button to open display or web link
- Combo
- Group with group border
- Embedded Displays
- Tabs
- XYPlot
- Image
- Macro support
- Alarm-sensitive border based on PV
- Limited Rule support: Color of rect/circle/label, visibility
- Caching

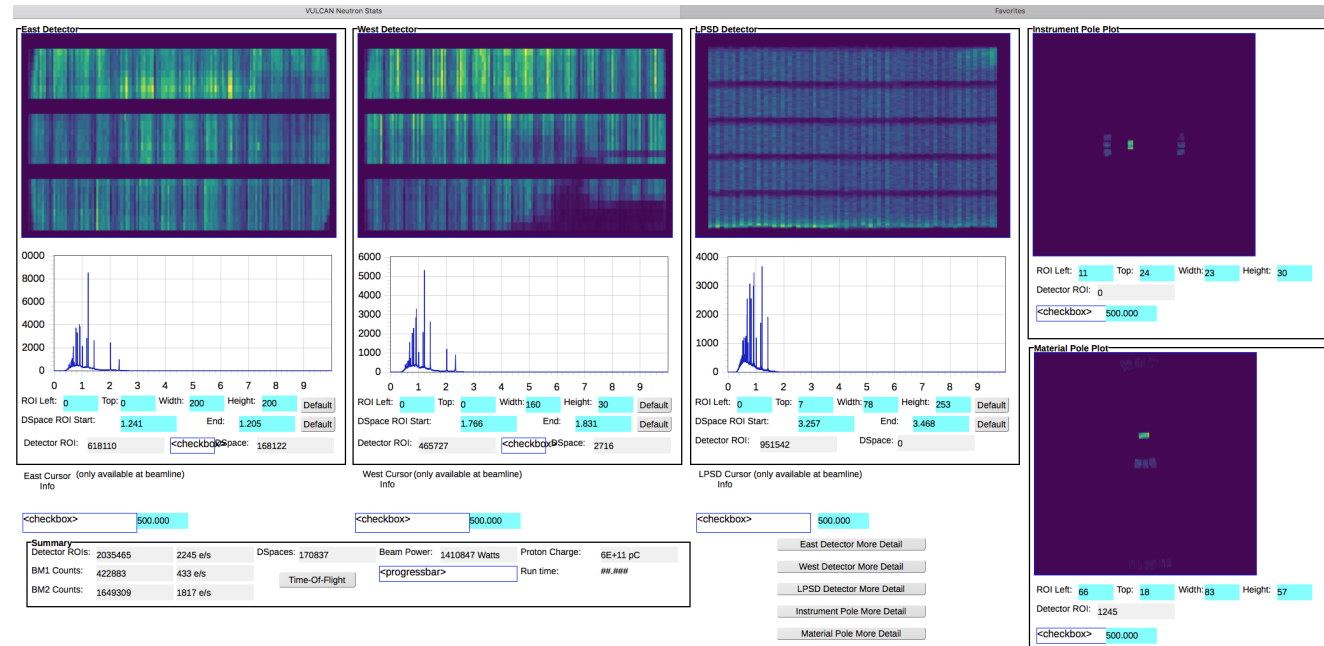
# Summary

Display Builder *Web Runtime* offers web access to much of the *Desktop* version

<https://github.com/kasemir/pvws>  
<https://github.com/kasemir/dbwr>

➔ [http://your\\_tomcat/dbwr](http://your_tomcat/dbwr)

1. git clone
2. ant
3. copy \*.war to Tomcat
4. Set environment:  
EPICS\_CA\_ADDR\_LIST, ..





# Limited Compatibility

## MEDM

```
Text
{
  object
  {
    x= 265
    y= 440
    width=155
    height=20
  }
  "basic attribute"
  {
    clr=54
  }
  textix="Hello"
}
```

## EDM

```
object activeXTextClass
beginObjectProperties
x 265
y 440
w 155
h 20
font "arial-bold-r-10.0"
fgColor index 5
value {
  "Hello"
}
endObjectProperties
```

## Qt Designer

```
<widget class="caLabel" name="caLabel_0">
  <property name="foreground">
    <color alpha="255">
      <red>10</red>
      <green>0</green>
      <blue>184</blue>
    </color>
  </property>
  <property name="text">
    <string>Hello</string>
  </property>
  <property name="geometry">
    <rect>
      <x>265</x>
      <y>440</y>
      <width>155</width>
      <height>20</height>
    </rect>
  </property>
</widget>
```

Why not just  
<text>Hello?

Dump of tool's in-memory "model".

# Simple, General Format

## Display Builder

```
<widget type="label">
  <x>268</x>
  <y>440</y>
  <width>155</width>
  <height>20</height>
  <text>Hello<text>
  <foreground_color>
    <color red="0" green="0" blue="0"/>
  </foreground_color>
</widget>
```

- XML
  - Somewhat human-readable
  - Parsers for every programming language
- “label”, “text\_update”
  - Not hinting at specific implementation